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Safety & Buildings Division
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Evaluation #

New Product #20079004
Replaces #200704-I

Wisconsin
Building Products Evaluation

Material	Insulating Concrete Form Work "Fold Form"
Manufacturer	Lite Forms Technology 1950 West 29th Street South Sioux City, NEBR 68776

SCOPE OF EVALUATION

GENERAL: This report evaluates the use of the Fold Form insulated concrete form wall system, manufactured by Lite Forms Technology, evaluated as permanent form work and insulation system for reinforced lintels, exterior and interior bearing and non-bearing walls, and foundation and retaining walls. The Fold Form insulated concrete form wall system was evaluated for safety requirements of the foam plastic and structural requirements for the codes listed below.

The **Comm** code requirements below in accordance with the current **Wisconsin Uniform Dwelling Code for 1 & 2 family dwellings, Chapters Comm 20-25:**

- **Foam Plastic:** The Fold Form insulated concrete form wall system was evaluated in accordance with the fire safety requirements of **s. Comm 21.11**.
- **Structural:** The Fold Form insulated concrete form wall system was evaluated in accordance with the structural requirements of **ss. Comm 21.02,** and **21.02(3)(c)**.

The **IBC** requirements below in accordance with the **Wisconsin Commercial Building Code, Chapters Comm 61-65:**

- **Foam Plastic:** The Fold Form insulated concrete form wall system was evaluated in accordance with the fire safety requirements **ss. IBC 2603.1**, **2603.2**, and **2603.3**.
- **Foundation Walls:** The Fold Form insulated concrete form wall system was evaluated in accordance with the requirements of **s**. **IBC 1805.5.5.**
- **Fire Endurance:** The Fold Form insulated concrete form wall system was evaluated in accordance with the requirements of **ss. IBC 2603.4**, **2603.5.1**, and **2603.5.2**.

Note: Structural calculations shall be submitted (job-to-job basis) in accordance with IBC Chapter 16 for Live, Ground Snow, Roof, Wind, and Seismic Loads.

DESCRIPTION AND USE

General: The Fold Form insulated concrete form is manufactured using 100% modified expanded polystyrene. The forms are used as permanent formwork for structural concrete load-bearing and non-load bearing residential and commercial, below- and above-grade walls. The forms are used in construction of reinforced concrete beams, lintels, exterior and interior walls, foundation and retaining walls. The forms remain in place after setting of concrete and shall be protected with an interior and exterior finish material.

Materials consist of:

- **Fold Form System Form Units:** The forms are available in seven standard sizes: nominal 4-, 6-, 8-, 10-, 12-, 14-, and 16-inch core-width units. The 4-inch core-width standard size unit is 12inches high and 48 inches long, with nominal 2-inch-thick EPS shells interconnected with twelve plastic web members spaced 8 inches on center. The 4-, 6-, 8-, 10-, 12-, 14- and 16-inch core width standard size unit is 12 inches high and 48 inches long, with nominal 2-inch-thick EPS shells interconnected with twelve plastic web members spaced 8 inches on center. The clear distance between face shells is 4, 6, 8, 10, 12, 14 and 16 inches for the 4-, 6-, 8-, 10-, 12-, 14- and 16-inch core width unit, respectively. In addition to the standard block unit, there are also corner units, adjustable corner kits, and extended brick ledger units.
- **Polystyrene:** Approved, Nominal 1.80 pcf density, Type IX.
- **Connector Element Webs:** Injection molded polypropylene plastic ties (factory-inserted), with flanges located at the surface of the EPS or ½-inch below the EPS surface. The ties, which are spaced 8 inches on center horizontally and 8 inches vertically, are available in different lengths to retain the opposing EPS boards at fixed clear distances of 4 inches to 16 inches. The plastic cross ties hold the two shells together, and provide a means of supporting reinforcing steel rebar inside the EPS units prior to concrete placement; and provide a mechanism for attaching interior and exterior finish materials.
- **Concrete:** Standard applications use a minimum 2500 psi at 28 days, with maximum 3/4-inch coarse aggregate. Concrete of higher strength may also be used. The concrete can be poured from a truck, by hand, or bucket. A concrete pump utilizing a 2" to 2 1/2" hose is recommended. The concrete shall comply with **s. Comm 21.02(3)(b)** and **s. IBC 1903.1**.
- **Reinforcement:** All steel reinforcement shall be in accordance with **s. IBC 1903.5.**

The Fold Form system is based on interlocking stacking form units consisting of two Fold Form expanded polystyrene (EPS) panels connected by molded high impact polypropylene plastic ties. Filled with concrete, the forms create a monolithic wall. The units serve as insulation and forms for load-bearing walls, shear walls and foundation walls.

The Fold Form units have a pre-formed interlocking mechanism along their top and bottom edges to facilitate stacking and provides solid friction between courses.

The Fold Form units are made of molded expanded polystyrene (EPS). The EPS used is Benchmark foam.

Wood members in contact with concrete for plates or window and door framing shall be preservative-treated with an approved wood preservative, and shall be attached with corrosion-resistant steel fasteners in accordance with **s. IBC 2304.9.5.**

TESTS AND RESULTS

The tests and results listed below cover both the current **Comm Code** requirements for the **Wisconsin Uniform Dwelling Code for 1 & 2 family dwellings** and **IBC** requirements:

- **Foam Plastic:** Surface Burning Characteristics of Fold Form insulated concrete form wall system, EPS, in accordance with **ASTM E84**, "Standard Test Method for Surface Burning Characteristics of Building Materials". Benchmark EPS classification in density of 1.80 pcf polystyrene, in thickness from 1-6 inches maximum as follows shall have a Smoke Developed Index of 300 and a Flame Spread Index of 20.

- **For Fire Resistive Wall Assemblies**, **Table 720.2.1.1** of **s. IBC 720.2.1.1** may be used.

LIMITATIONS OF APPROVAL

The **Comm** limitations below are in accordance with the current **Wisconsin Uniform Dwelling Code, for 1 & 2 family dwellings:**

- **Foam Plastic:** Fold Form insulated concrete forms system is approved for use with a thermal barrier to separate the blocks from interior spaces in accordance with **s. Comm 21.11(1)**. Where a 1-inch thickness of masonry does not separate the polystyrene blocks from the building interior, including at the top of the wall, a thermal barrier, which has a finish rating of at least 15 minutes, shall be provided.

1. Fold Form insulated concrete forms are approved for use in combustible non-rated construction in accordance with **s. Comm 21.11**. In one- or two-family dwellings, thermal barriers shall be provided to separate the forms from the occupied space of the dwellings per **s. Comm 21.11**.
2. The exterior face of the blocks shall be finished with an approved weather covering and must be protected from ultraviolet light.

- **Structural:** Fold Form insulated concrete forms are approved as structural building elements.

1. The units are approved for use as concrete forms for basement walls and exterior walls when the resulting concrete core thickness satisfies **Table 21.18-A** for one- or two-family dwellings, or when structural calculations for the product are submitted for review.
2. Walls shall be anchored to all floors and roofs. Walls shall be interconnected at corners by embedding and lapping the reinforcement.
3. Structures are **limited** to two stories in height.
4. The forms are approved for use as concrete forms for basement walls, exterior walls and retaining walls when structural calculations are submitted to the department by a Wisconsin registered professional engineer or architect.
5. Below grade walls shall be damp-proofed when required by the local building department.
6. Damp-proofing and water-proofing materials shall be approved by Fold Form and shall be free of solvents that will adversely affect the EPS foam.

NOTE: Fold Form insulated concrete forms wall system was **not** evaluated for compliance with the thermal requirements of **Subchapter VI, ss. Comm 22.20**, **22.21**, **22.23**, **22.25**, **22.27**, **22.28**, and **22.31** of the current **Wisconsin Uniform Dwelling Code, for 1 & 2 family dwellings**.

The **IBC** limitations below are in accordance with the current **Wisconsin Amended ICC Code:**

- **Foam Plastic:** Fold Form insulated concrete forms system is approved for use with a thermal barrier to separate the blocks from interior spaces in accordance with **s. IBC 2603.4.**

1. In accordance with **s. IBC 2603.4.1.6**, when Fold Form insulated concrete forms are used within the attic or crawl space where entry is made only for service utilities, the foam plastic insulation shall be protected against ignition by 1-1/2" thick mineral fiber insulation, a ¼" thick wood structural panel, particleboard or hardboard, gypsum wallboard, corrosion-resistant steel or other approved material installed so that the foam plastic is not exposed.
2. The protective covering shall be consistent with the requirements for the type of construction.
3. The exterior face of the blocks shall be finished with an approved weather covering and must be protected from ultraviolet light.
4. The crawl space shall not be used for storage or air handling purposes, there are no interconnected basement areas and entry to the crawl space is only for service of utilities.

- **Structural:** Design of concrete formed by Fold Form insulated concrete forms must comply with **IBC Chapter 16** and **Chapter 19** with the following requirements:

1. The forms are approved for use as concrete forms for basement walls, exterior walls and retaining walls when structural calculations are submitted to the department by a Wisconsin registered professional engineer or architect.
2. Design calculations of walls must comply with **s. IBC 1901.2.** Use of the empirical design approach specified in **s. 2109.1 [Comm 62.2109(1)]** is prohibited.

3. Design of lintels shall comply with the applicable provisions of **IBC Chapter 16.**
4. Wall loading shall be in accordance with **IBC Chapter 16**.
5. Minimum wall reinforcement shall conform to **s. IBC 1901.2**. When the code requires that vertical and horizontal reinforcement be spaced no further apart than 18 inches or three times the wall thickness, whichever is less, the maximum concrete wall thickness along the length of the wall is permitted to be used to determine rebar spacing.
6. Walls shall be anchored to floors and roofs in accordance with **s. IBC 1604.8.2**. Walls shall be interconnected at corners by embedding and lapping reinforcement in accordance with the code.
7. Design of shear walls shall be in accordance with **ss. IBC 1901.2** and **1910**.
8. Structures per this evaluation are **limited** to two stories in height plus a basement. Structures exceeding two stories do not fall under this evaluation. Documentation shall be submitted in accordance with **s. Comm 61.30.**
9. Below grade walls shall be damp-proofed when required by the local building department, water-proofed in accordance with **s. IBC 1806**.
10. Damp-proofing and water-proofing materials shall be approved by Fold Form and shall be free of solvents that will adversely affect the EPS foam.
11. Special inspection is required as noted in **s. IBC 1704**, for placement of reinforcing steel and concrete, and for concrete cylinder testing, except that special inspection is not required for foundation stem walls conforming to **Table 1805.4.2** of the **IBC**. Additionally, when the building official approves, special inspection is not required when all of the following conditions are met:

    a) Wall systems are a maximum of 8 feet high and are limited to use in single-story construction of Group R-3, or Group U Occupancies.
    b) Maximum height of a concrete pour is 48 inches. Succeeding lifts must be placed in accordance with **s. IBC 1905.10.**
    c) Installation is by properly trained installers approved by Fold Form.
    d) The installation instructions indicate methods used to verify proper placement of concrete.
12. Walls constructed with Fold Form insulated concrete form blocks are considered **Type VB Construction**. When constructed in accordance with the fire-resistance-rated wall assembly detailed in the **TEST AND RESULTS** section of this approval the Fold Form forms are recognized for use in buildings of **Type VA Construction**.

NOTE: Fold Form insulated concrete forms wall system was **not** evaluated for compliance with the thermal requirements of **s. Comm 63.1018**.

Alternate Design: In lieu of calculations, the structural design of reinforced concrete formed by Fold Form insulated concrete forms wall system for residential construction is permitted to comply with the *Prescriptive Method for Insulating Concrete Forms in Residential Construction* (publication No. EB118), dated May 1998, published by the Portland Cement Association (PCA). Buildings constructed with the Fold Form insulated concrete forms wall system and designed in accordance with the alternate design, shall not exceed a height of two stories plus a basement, where the maximum unsupported wall height is 10 feet.

Identification: Each package bears a label specifying the name and address of the manufacturer **Fold Form** and one of the additional listees (Benchmark Foam, Inc.) Additionally, product labels indicate the Wisconsin Building Product Evaluation Number (**200704-I**), and the name and logo of the quality control agency.

This approval will be valid through December 31, 2012, unless manufacturing modifications are made to the product or a re-examination is deemed necessary by the department. The product approval is applicable to projects approved under the current edition of the applicable codes. This approval may be void for project approvals made under future applicable editions. The Wisconsin Building Product Evaluation number must be provided when plans that include this product are submitted for review.

DISCLAIMER

The department is in no way endorsing or advertising this product. This approval addresses only the specified applications for the product and does not waive any code requirement not specified in this document.

Revision Date:
Approval Date: October 16, 2007 By: _____

Lee E. Finley, Jr.
Product & Material Review
Integrated Services Bureau

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